STORAGECRAFT™ SHADOWPROTECT 4™

ShadowProtect™ ImageManager

User Guide

STORAGECRAFT™

Leading the Way to Safer Computing

User Guide for

ShadowProtect™ ImageManager

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Chapter 1: About the User Guide

Welcome to the StorageCraft *ShadowProtect™ ImageManager User Guide*. This Guide describes the purpose of ImageManager, the ImageManager technology, and how to use it to manage your backup image file chains.

This Guide is divided into the following major sections:

- Chapter 2: ImageManager Overview 6
- Chapter 3: Understanding the ImageManager UI 9
- Chapter 4: Configuring ImageManager 14
- Chapter 5: Verifying Backup Image Files 23
- Chapter 6: Consolidating Backup Image Files 25
- Chapter 7: Replicating Backup Image Files 27
- Chapter 8: Using HeadStart Restore 29
- Chapter 9: Browsing Backup Image Files 32

Additionally, this Guide includes the following general information sections.

- Chapter 10: Product Support 33
- Chapter 11: Glossary 34
- Chapter 12: End User License Agreement 38

Additional Information

- For emerging issues and other resources, see the following:
  - The `readme.txt` file included with ImageManager product files.
  - The StorageCraft technical support Web site at www.storagecraft.com/Community
- For more information about using ShadowProtect, see the StorageCraft *ShadowProtect User Guide*.
- For a glossary of ShadowProtect terms and definitions, see Chapter 11: Glossary 34.

Documentation Conventions

This symbol designates **Note** or **Warning** text that highlights critical information about the configuration and/or use of VirtualBoot.

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Chapter 2: ImageManager Overview

ShadowProtect ImageManager lets you manage Incremental backup images and the storage space consumed by your backup image files. Based on a policy that you crate, ImageManager automatically consolidates Incremental backup image files into daily, weekly and monthly Incremental images. Additionally, ImageManager provides ongoing verification and replication services for the files that comprise your backup images.

ImageManager consists of the following components:

ImageManager Service: A Windows service that performs the backup file management as defined by the policy.

ImageManager Client: The UI that lets you create and manage retention policies for your ShadowProtect environment.

This section includes the following topics:

- ImageManager Features 6
- HeadStart Restore Scenarios 7
- Installing ImageManager 8

Note: ShadowProtect leverages ImageManager policies only when using the Continuous Incrementals backup schedule. Standard Weekly and Monthly backup schedules do not use ImageManager. For more information, see "Creating Backup Image Files" in the *ShadowProtect User Guide*.

2.1 ImageManager Features

ImageManager provides the following basic features:

Collapse: Based on a policy that you define, ImageManager automatically consolidates Incremental backup image files. This limits the risk of having large backup image file chains where one bad file can render a whole backup image useless.

Verify: Based on a frequency that you define, ImageManager automatically verifies, and re-verifies, the integrity of your backup image files. The verification process is similar to that available manually by running the Verify Wizard in ShadowProtect.

Replicate (Local): Based on a profile that you define, ImageManager automatically creates redundant copies of backup image files to locally-attached hard drives. Smart replication technology evaluates the consolidation policy to avoid transferring unnecessary or obsolete backup image files.

Beyond these basic features, ImageManager offers the following premium features as part of ShadowProtect ImageManager Enterprise, which is available for an extra fee:

Replicate (Network): Based on a profile that you define, ImageManager automatically creates redundant copies of backup image files to a network share. Smart replication technology reduces bandwidth usage by evaluating the consolidation policy and transferring only the required consolidated image files.

Replicate (Off-site): Based on a profile that you define, ImageManager automatically creates redundant copies of backup image files to an FTP server. Smart replication technology reduces

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bandwidth usage by evaluating the consolidation policy and transferring only the required consolidated image files.

HeadStart Restore: HeadStart Restore (HSR) is the ability to restore a backup image while ShadowProtect continues to add Incremental backup images to the same backup image chain. In a world of multi-Terabyte storage HSR lets you short-circuit the restore process, greatly limiting the down-time associated with a hardware or software failure. For information about using HeadStart Restore, see HeadStart Restore Scenarios 7.

For more information about licensing ImageManager Enterprise features, see Section 4.2.2: License 18.

2.2 HeadStart Restore Scenarios

The concept of a HeadStart Restore (HSR) is extremely powerful, particularly for today's business environments where multi-Terabyte servers are becoming the norm. HSR lets you take advantage of your ShadowProtect backup images in ways that were previously not possible, as illustrated by the following usage scenarios.

Virtual Server Migration

Problem: You need to migrate a database server with 20TB of data to a new Virtual Machine environment, but you cannot afford to have the server offline for three days it takes to migrate the data.

ImageManager Solution: Keep the old server running, and generating incremental backups, while you begin a HeadStart Restore of the same backup image chain into a Virtual Machine file (VMDK, ESX Server, VHD). Over time, the HSR catches up to the most current incremental from the database server, at which point you can take the old server down in off hours, apply the final incremental backup to the new server, and bring the new system on-line very quickly. You can even migrate the operating system volume by doing a Hardware Independent Restore (HIR) to make sure the migrated OS boots properly on the new server hardware.

Hardware Failure

Problem: You have a database server and the 20TB disk array crashes. You need to get the system back on-line and replace the disk subsystem.

ImageManager Solution: Use ShadowProtect's VirtualBoot feature to boot the latest backup image of your database server and configure the VM to continue adding Incremental backups to your original backup image chain. Users can then continue to use the VM database server as if the original is still on-line.

Once the VM is running, start an HSR to the database server's new disk subsystem. When HSR catches up to the most current incremental, you can finalize the HSR installation on the new disk subsystem, take the VM down, then bring the original database server back on-line. Using ImageManager with VirtualBoot reduces downtime from several days to only minutes.

Virtual Standby Server

Problem: You want to have a stand-by server that can take over should your primary server fail, but you can't afford the high-priced server mirroring technology.

ImageManager Solution: Your production server generates continuous incremental backups. Configure an HSR solution to automatically restore those Incremental backup images into a Virtual Machine file (VMDK, ESX Server, or VHD). If your production server fails for any reason, finalize the HSR, then use the Recovery Environment to apply any remaining Incremental images to the Virtual

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Machine (a matter of minutes), then bring it on-line as a replacement for the failed production server.

2.3 Installing ImageManager

ShadowProtect includes the ImageManager software, but does not install it by default. Before installing ImageManager, make sure your system meets the following requirements:

- ImageManager requires Microsoft .NET version 2. The 32-bit ImageManager installer installs .NET automatically if it is not present. However, the 64-bit installer does not. You must install it manually before installing ImageManager.

To install ImageManager

1. Launch the ImageManager installer (`ImageManagerSetup.exe`).

   You can find the ImageManager installer in the following locations:

   - **ShadowProtect Recovery CD:** `\Installers\ImageManagerSetup.exe`
   - **Online:** On the StorageCraft Trial Downloads page (http://www.storagecraft.com/backup-support.php).

2. Select the install language, then click **OK**.
3. On the ImageManager Wizard Welcome page, click **Next**.
4. Follow the steps in the Installation Wizard to install the ImageManager software.
5. When the installation completes, click **Finish**.

You can launch ImageManager in Windows by selecting **Start** > **Programs** > **ShadowProtect** > **ShadowProtect ImageManager**.

Note: The ImageManager agent loads automatically once ImageManager is installed. When it loads, it uses a configuration file (`ImageManager.exe.config`) to set the agent parameters. You can modify the configuration file to change the port that the ImageManager agent uses, if desired.

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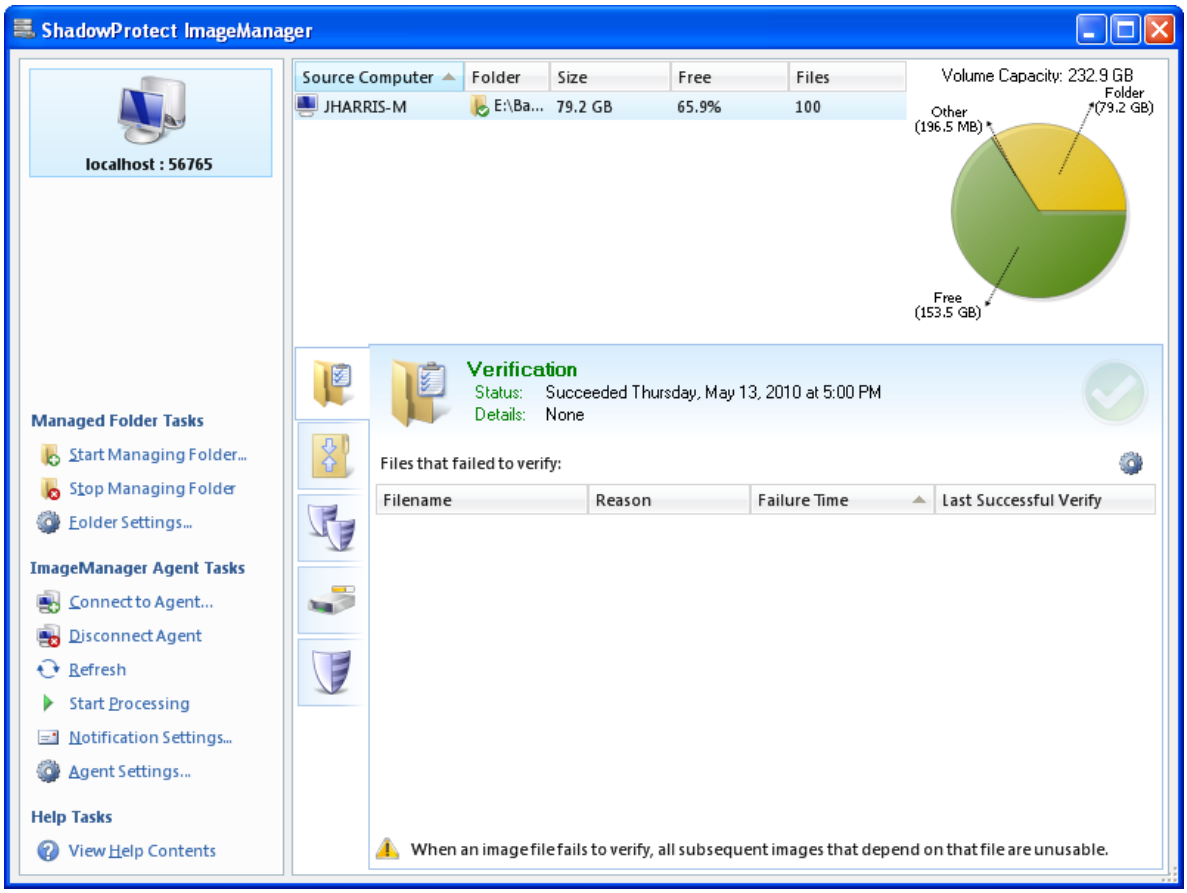
Chapter 3: Understanding the ImageManager UI



ImageManager User Interface

The ImageManager UI consists of the following components:

- Navigation Pane 9
- Managed Folder Pane 11
- Services Pane 12

3.1 Configuration Pane

The left-side Configuration pane displays a list of currently connected ImageManager agents. Select an agent to have ImageManager display information from that agent in the ImageManager UI.

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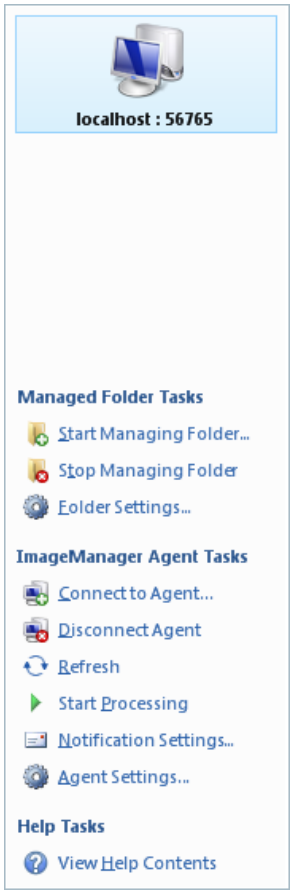

ImageManager Configuration pane

The Navigation pane also provides links to the following ImageManager features and functionality:

Table 1: Navigation pane links

Link	Description
Managed Folder Tasks	
Start Managing Folder	Opens the Managed Folder Settings dialog box, where you specify the storage locations for backup image files that you want ImageManager to manage (see Section 4.3: Creating a Managed Folder 20).
Stop Managing Folder	Removes the currently selected managed folder (in the Managed Folder pane).
Folder Settings	Opens the Managed Folder Settings dialog box, where you can modify the settings for the currently selected managed folder (see Section 4.3: Creating a Managed Folder 20).
ImageManager Agent Tasks	
Connect to Agent	Opens the Connection pane so you can connect to a system's ImageManager agent (see Section 4.1: Connecting to an ImageManager

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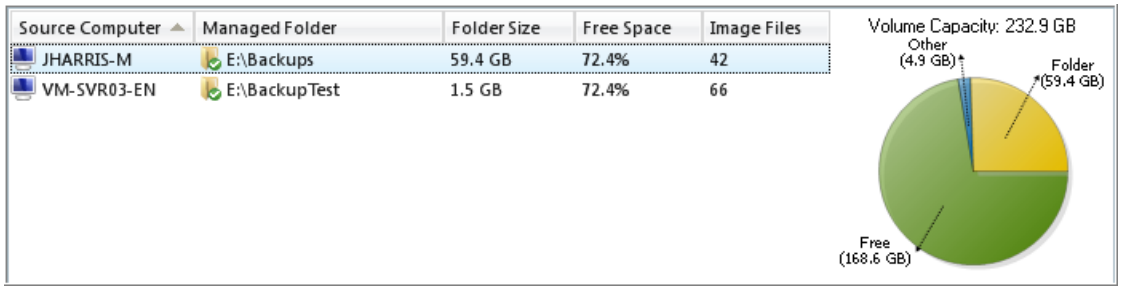
Link	Description
	Agent 14).
Disconnect Agent	Disconnects ImageManager Console from the currently connected ImageManager agent.
Refresh	Instructs the ImageManager agent to re-query the system and update the data displayed in ImageManager Console.
Start Processing	The ImageManager agent examines its verification and consolidation schedule, and starts any operations that are scheduled to run at this time.
Notification Settings	Opens the Notification Settings dialog box, where you can configure the Email notification parameters for ImageManager events (see Section 4.4: Configuring ImageManager Notifications 20).
Agent Settings	Opens the Agent Settings dialog box, where you can configure ImageManager agent behavior and licensing (see Section 4.2: Configuring an ImageManager Agent 16).
Help Tasks	
View Help Contents	Opens the ImageManager help system.

3.2 Managed Folder Pane

The top-center Managed Folder pane displays information about the managed folders associated with the currently connected ImageManager agent. Select a managed folder in the list to see a graphical representation of the folder usage. Selecting a managed folder also puts focus on it for operations in the Navigation and Services panes.



ImageManager Managed Folder pane

The Managed Folder pane provides the following information about each managed folder:

Table 2: Information in the Managed Folder pane

Link	Description
Source Computer	The computer name of the system where the backup image files in the managed folder were created.

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Link	Description
Managed Folder	The path to the managed folder.
Folder Size	The size of the managed folder.
Free Space	The amount of free space available on the storage device where the managed folder resides. The Managed Folder pane also displays a graphical view of the storage space in the managed folder's volume.
Image Files	The number of backup image files contained in the managed folder.

3.3 Services Pane

The bottom-center Services pane provides access to ImageManager services. Each service has a separate tab that you can click to open the service-specific pane. Within each pane you can see information about the selected service, and perform tasks related to the service.

Table 3: ImageManager Services

UI Component	Description
Verification	Displays information about ImageManager's automated backup image verification service. From the Verification pane, you can also perform the following tasks: **Edit Verification Settings:** Opens the Verification Settings dialog box, where you can configure the automated verification service. For more information, see Chapter 5: Verifying Backup Image Files 23.
Consolidation	Displays information about ImageManager's automated image file consolidation service. From the Consolidation pane, you can also perform the following tasks: **Edit Consolidation Settings:** Opens the Consolidation Settings dialog box, where you can configure the automated verification service. For more information, see Chapter 6: Consolidating Backup Image Files 25 .
Replication	Displays information about ImageManager's automated backup image replication service. From the Replication pane, you can also perform the following tasks: **Define New Replication Target:** Opens the Replication Target Settings dialog box, where you can configure a target location to use with the replication service. **Remove Selected Replication Target:** Deletes the currently selected replication target.

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UI Component	Description
	Edit Selected Replication Target: Opens the Replication Target Settings dialog box, where you can modify the configuration of the currently selected target. **Enable Selected Replication Target:** Resumes replicating to the selected target. **Disable Selected Replication Target:** Stops replicating to the selected target. For more information, see Chapter 7: Replicating Backup Image Files 27
HeadStart Restore	Displays information about ImageManager's HeadStart Restore service. From the Head Start Restore pane, you can also perform the following tasks: **Define New HeadStart Job:** Opens the HeadStart Job Settings dialog box, where you can configure a new HeadStart job. **Remove Selected HeadStart Job:** Deletes the selected HeadStart job. **Edit Selected HeadStart Job:** Opens the HeadStart Job Settings dialog box, where you can modify the currently selected HeadStart job. **Enable Selected HeadStart Job:** Starts the selected HeadStart job. **Disable Selected HeadStart Job:** Stops the selected HeadStart job. **Finalize Targets in Selected HeadStart Job:** Opens the Finalize dialog box, where you can prepare the selected HSR target for use once the restoration process is complete. For more information, see Chapter 8: Using HeadStart Restore 29.
Backup Images	Displays information about the backup image files in the currently selected managed folder. The Backup Images pane displays a daily list of backup image files. You can browse to a particular day to see the backup image files created on that day. For more information, see Chapter 9: Browsing Backup Image Files 32.

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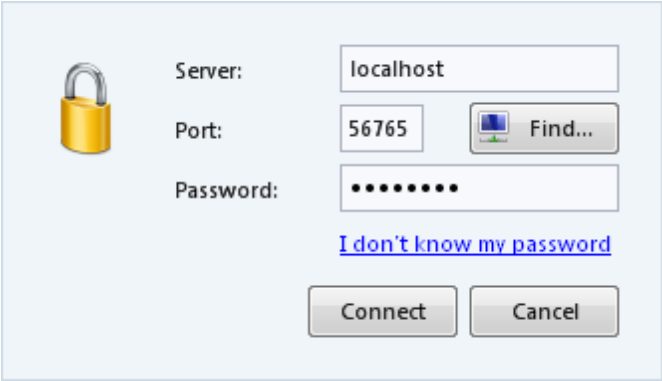
Chapter 4: Configuring ImageManager

Before using any of the ImageManager services, you must do some basic configuration so that ImageManager console can access the system you want to manage. These configuration tasks follow a logical order:

- Connecting to an ImageManager Agent 14
- Configuring the ImageManager Agent 16
- Creating a Managed Folder 20
- Configuring ImageManager Notifications 20

4.1 Connecting to an ImageManager Agent

You must connect the ImageManager console to one or more ImageManager agents in order to manage backup image files.



To connect to an ImageManager agent

1. Launch the ImageManager console.

   Upon startup, ImageManager displays a connect dialog box.

2. In the Connect dialog box, provide the required information, then click **Connect**.

Server	The name or IP address of the system running the ImageManager agent. You can use the keyword `localhost` to connect to an ImageManager agent running on the same system as the ImageManager console. Click **Find** to browse the network, by Computer Name, for a system you want to connect to.
Port	The TCP port used to communicate with the ImageManager agent. The default ImageManager agent port is `56765`. You can change the port used by ImageManager agent in the `ImageManager\ImageManager.exe.config` file. **Note:** You might have to modify your firewall settings to make the ImageManager agent port accessible.
Password	The ImageManager agent password.

	The default password, when connecting to an ImageManager agent for the first time, is "password". Following your first connection, ImageManager prompts you to change the password. If you forget the ImageManager agent password, click I don't know my password to get instructions about how to reset your password (see Resetting the Agent Password 15).

You can connect to multiple ImageManager agents simultaneously. In the Configuration pane, click **Connect to Agent** to open the Connect dialog box and connect to another ImageManager agent.

Resetting the Agent Password

When first installed, each ImageManager agent has a default password of "password". Use this when connecting to the ImageManager Agent for the first time. After connecting for the first time, you must change the Agent password. Once you have changed the password, if you forget it StorageCraft provides a password reset utility so you can reset the Agent password.

To reset the agent password

1. Contact StorageCraft Support 33 to get the Password Reset utility.
2. Extract the password reset utility to a directory of your choice.
3. Open a Windows command line shell (`cmd.exe`).

   On Windows Vista / 7 / 2008 / 2008R2 systems, run the Password Reset tool from an administrative command prompt (right-click on the Command Prompt shortcut, then select **Run as Administrator**).
4. Browse to the directory where you extracted the password reset utility, then execute `ImageManager.resetpassword.exe`.
5. Start ImageManager, then connect to the ImageManager Agent using the default password of "`password`".
6. When prompted, reset the agent password to a value of your choosing.

Authentication Restrictions

Because the ImageManager Console and ImageManager Agent communicate through a secure TCP connection, the Console must be able to authenticate to the Agent. If you install the Console and Agent on the same computer, or on computers in the same Windows domain, this happens automatically in the background.

However, if you install the Console and Agent on computers in different domains, or in a Windows workgroup, you must create a user account for the Console to use on the computer where the Agent is running. This account must have the same credentials (username and password) as the logged-in account used to start the Console. For example:

Console Computer	• In workgroup MSHOME • Logged in as JDoe

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	• ImageManager Console running
Agent Computer	• In workgroup MSHOME • Not logged in • ImageManager Agent running (under the context of LocalSystem)

In order for ImageManager Console to successfully authenticate to ImageManager Agent, the Agent computer must have a "JDoe" user account with the same password as the "JDoe" user account on the Console computer.

4.2 Configuring an ImageManager Agent

From the ImageManager console, you can modify the settings of any ImageManager agent that you are currently connected to. The Agent Settings page includes the following tabs:

- General 16
- License 18
- About 19

General

The settings on the General tab let you configure the ImageManager agent properties.

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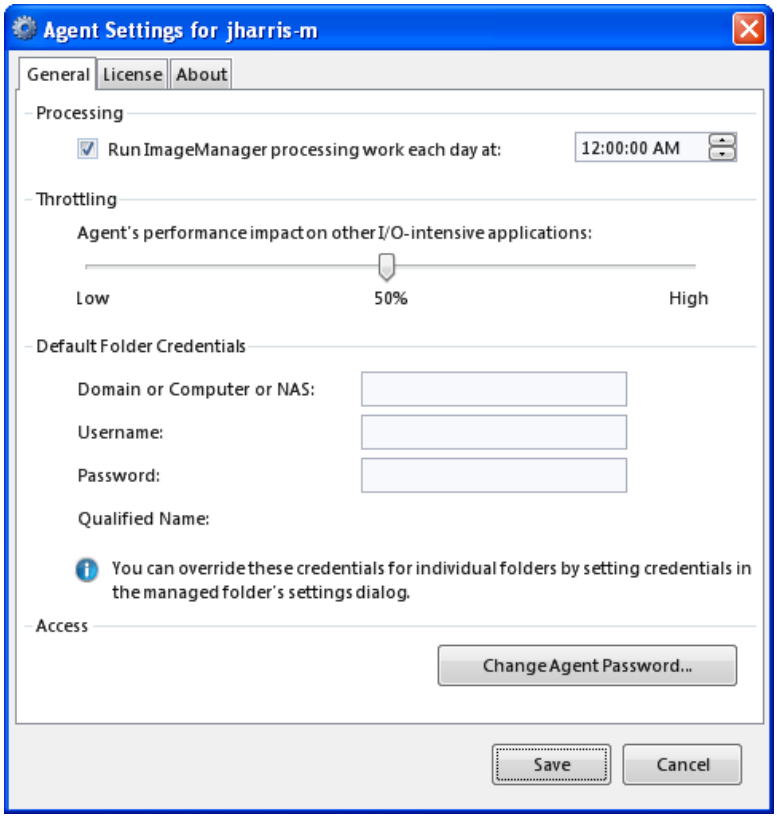

ImageManager Agent Settings - General

To modify ImageManager agent properties

1. Launch the ImageManager console.
2. In the Configuration pane, click **Agent Settings**.
3. In the Agent Settings dialog box, provide the required information, then click **Save**.

Control	(Default: Enabled at 12:00 AM) Lets you specify a time of day when the ImageManager agent performs its daily validation and consolidation operations. Disabling this setting suspends the ImageManager agent's automated re-verification and consolidation services. However, you can manually start the ImageManager agent processing by clicking **Start Processing** in the Configuration pane (see Section 3.1: Configuration Pane 9).
Throttling	The amount of I/O bandwidth to apply to ImageManager agent operations.
Default Folder Credentials	The default authentication credentials used by the ImageManager agent to access managed folders. You can override these credentials for a specific managed folder, if necessary (see Creating a Managed Folder 20).
Access	Click **Change Agent Password** to update the password used to access the ImageManager agent.

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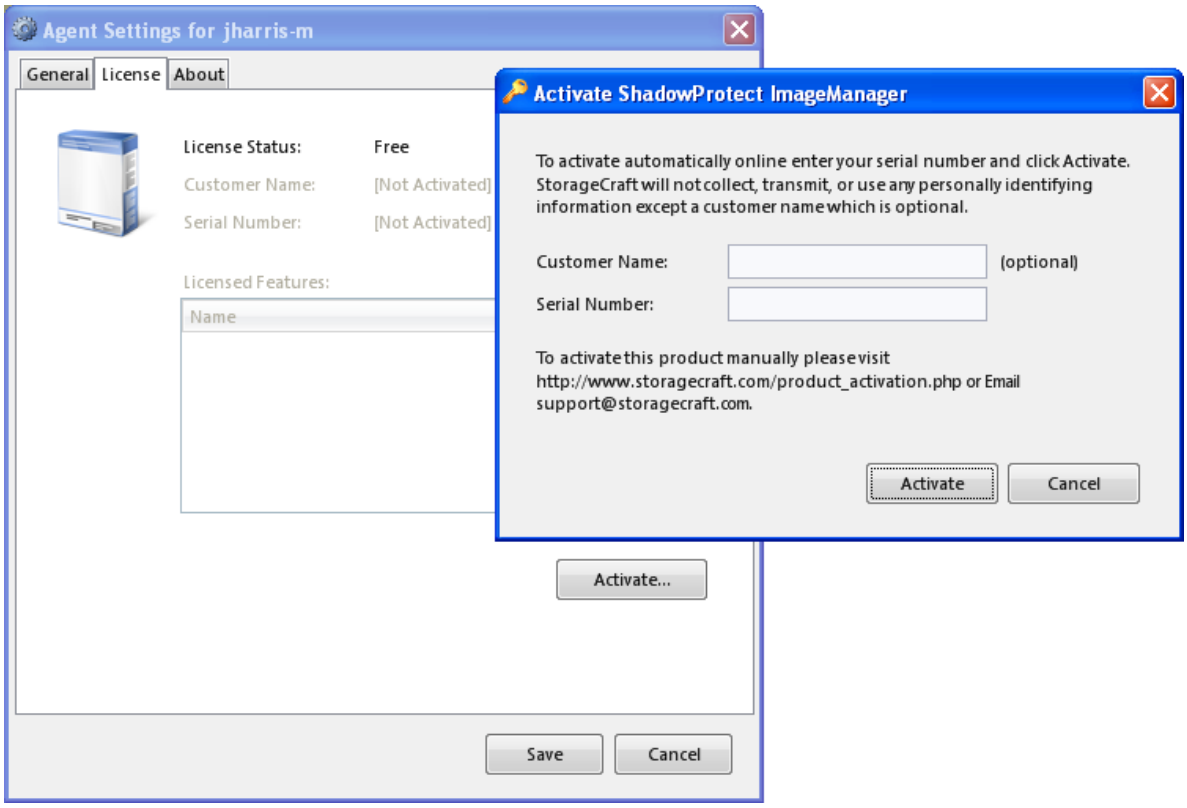
Note: To modify the ImageManager agent port setting, edit the ImageManager configuration file: `ImageManager\ImageManager.exe.config`.

License

The License tab lets you specify a serial number to activate ImageManager Enterprise (IME) features.

StorageCraft licenses IME on a per-job basis. Each "job" license supports one each of the following IME operations: Replication (Network), Replication (Off-site), and HeadStart Restore (For more information about each of these operations, see ImageManager Features 6). You can use the operations on a single Backup Image Set (see Glossary 34), or split them between multiple Backup Image Sets.

Note: While you can purchase as many IME job licenses as needed, each license is valid for a single ImageManager console. You cannot purchase an IME license and divide its jobs among multiple ImageManager consoles. For more information about ImageManager licensing, see ImageManager License Scenarios 19.



ImageManager Agent Settings - License

To activate ImageManager Enterprise features

1. In the Agent Settings License tab, click **Activate**.
2. In the Activate ShadowProtect ImageManager dialog box, provide the requested information, then click **Activate**.

   Customer Name: (Optional) Specify the name of the product purchaser, either person or

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organization.

Serial Number: Enter the Product Key that you received when purchasing IME jobs.

3. ImageManager notifies you if the activation process was successful.
    a. If the activation is successful, click **OK**.
    b. If the activation was not successful, review the message to determine why the activation was unsuccessful. To correct the problem, do one of the following:
        i. Review the information in the Product Activation dialog box for accuracy. Correct any errors, then **Activate** to resubmit the activation request.
        ii. If your computer cannot successfully communicate to the activation server or the Internet, wait for a while and try the activation process again. If you continue to have problems activating IME features, contact StorageCraft support (see Product Support 33).

ImageManager License Scenarios

The following licensing scenarios demonstrate the use of ImageManager Enterprise licenses. If you have additional questions, please contact a StorageCraft Sales Representative.

Example 1

Environment: I have Backup Image Sets from five servers that I want to manage from a single ImageManager Enterprise console. I need to replicate each of the servers locally and off-site, and I would like to start using HeadStart Restore as well.

Licensing Solution: Purchase one ImageManager Enterprise license with a 5 jobs.

Example 2

Environment: I have three servers, two of which are being backed up to one physical location, and one to a separate physical location. I need to replicate each of the servers locally and off-site, and I would like to start using HeadStart Restore as well.

Licensing Solution: Purchase two IME licenses (one for each physical location). Purchase two jobs for the first location and one job for the second location.

Example 3

Environment: I have four servers (A, B, C, and D) managed by a single ImageManager installation. I want to replicate server A and B backups off-site, server C backups locally, and server D to use HeadStart Restore.

Licensing Solution: Purchase one ImageManager Enterprise license with 2 jobs. Servers A and B use two Off-site Replication operations; server C uses one Local Replication operation; and server D uses one HeadStart Restore operation. I also have one Local Replication operation and one HeadStart Restore operation left for future use.

About

The About tab displays version information about the ImageManager agent.

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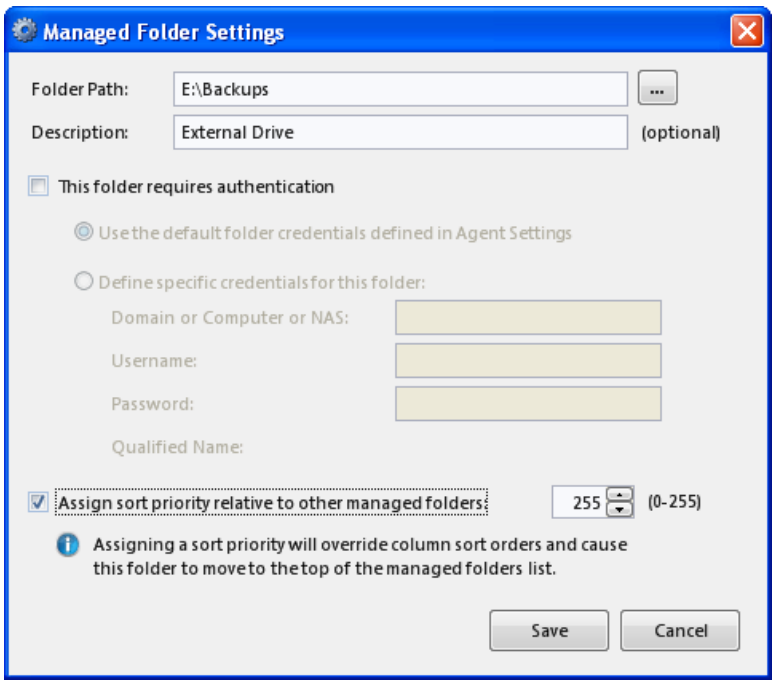
4.3 Creating a Managed Folder

You must connect the ImageManager console to one or more ImageManager agents in order to manage backup image files.



ImageManager Managed Folder Settings dialog box

To create a new managed folder

1. Launch the ImageManager console.
2. In the Configuration pane, click **Start Managing Folder**.
3. In the Managed Folder Settings dialog box, provide the required information, then click **Save**.

Folder Path	The path to the new managed folder. You can type, or browse to, the desired folder.
Description	(Optional) A description of the managed folder.
Authentication	(Conditional) The authentication credentials needed to access the managed folder. You can either use the default credentials specified in the ImageManager agent settings (see Configuring an ImageManager Agent 16), or specify authentication credentials specific to this managed folder.
Assign sort priority	(Default: Disabled) When enabled, ImageManager sorts the managed folders in the Managed Folder pane by the specified sort value (0 - 255). ImageManager sorts its managed folders in ascending order.

4.4 Configuring ImageManager Notifications

ImageManager can automatically send Email notifications when specific events occur.

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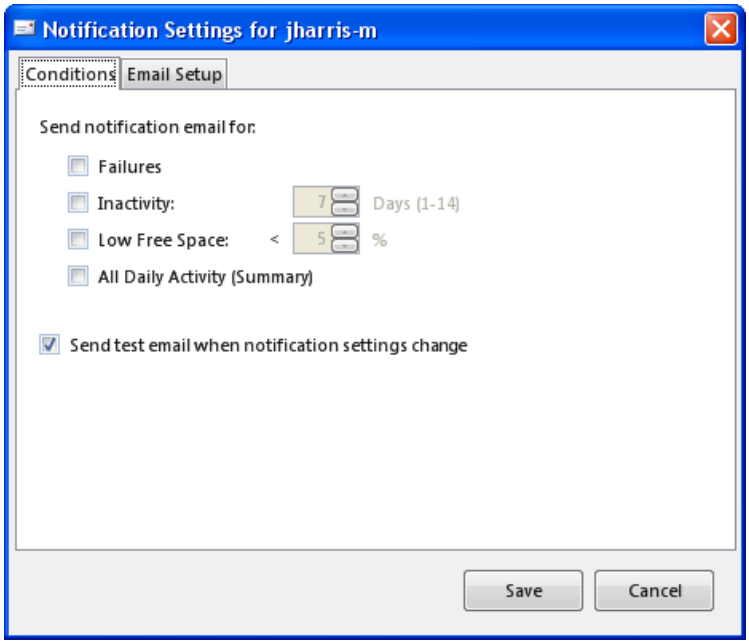
To modify the notification settings

1. Launch the ImageManager console.
2. In the Configuration pane, click **Notification Settings**.
3. In the Notification Settings dialog box, select the **Conditions** tab, then select the events that you want to generate Email notifications.



ImageManager events that generate notifications

Failures	Send an Email when an ImageManager operation fails.
Inactivity	Send an Email when the ImageManager agent is inactive for the specified number of days.
Low Free Space	Send an Email when the space available in the managed folder drops below the specified threshold.
All Daily Activity (Summary)	Send a daily Email with a summary of the ImageManager operations.
Send test email	Sends an Email whenever the ImageManager notification settings change.

4. In the Notification Settings dialog box, select the **Email Setup** tab to configure the Email account that you want to receive the Email notifications.

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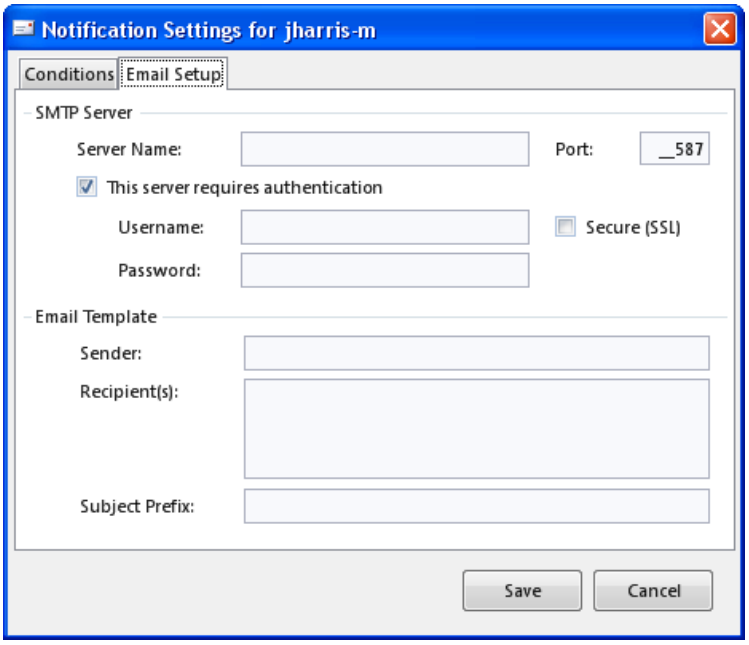

Email account configuration for ImageManager notifications

SMTP Server	The SMTP server name and port that ImageManager uses to send the Email notification. If necessary, provide valid authentication credentials for the SMTP server. Select **SSL** to send the Email via secure connection.
Email Template	The Email configuration. Provide the Email recipients and , if desired, a Sender name and Subject line for the notification emails.

5. Click **Save**.

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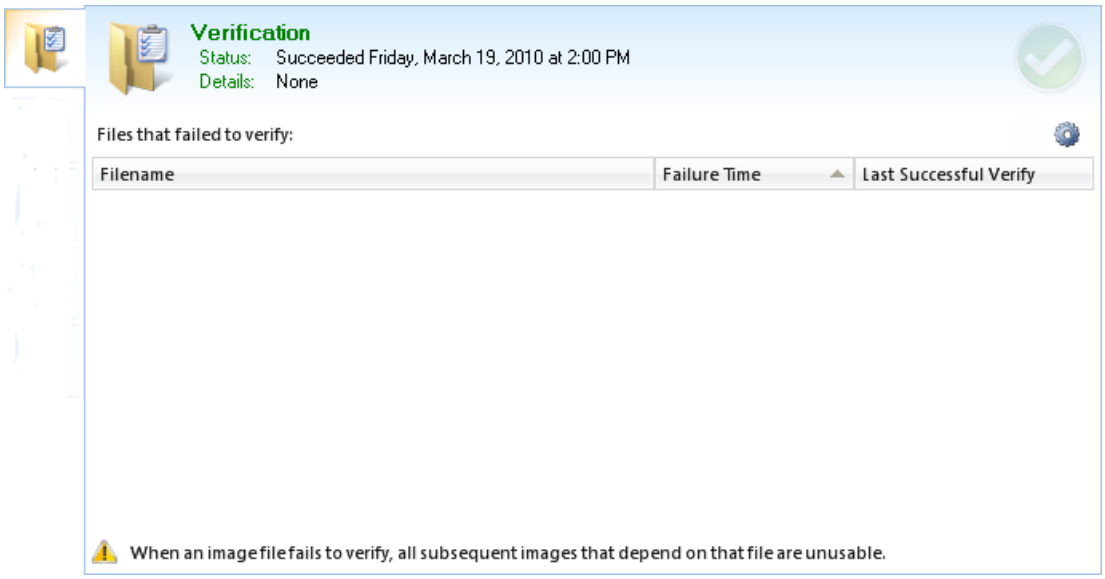
Chapter 5: Verifying Backup Image Files

The ImageManager verification service lets you periodically test the integrity of your backup image files. This verification of file integrity is similar to the manual process provided by ShadowProtect in the Verify Wizard (see "Verifying Backup Image Files" in the *ShadowProtect User Guide*). You can configure the verification service in the ImageManager Verification pane.


Verification
Status: Succeeded Friday, March 19, 2010 at 2:00 PM
Details: None
Files that failed to verify:
Filename
Failure Time
Last Successful Verify
When an image file fails to verify, all subsequent images that depend on that file are unusable.

The ImageManager Verification pane

While The Verification service is enabled by default, you can configure specific verification behavior on a per-managed-folder basis.

To configure the verification service

1. Launch the ImageManager console.
2. In the Managed Folder pane, select the managed folder you want to work with.
3. In the Services pane, select **Verification** .
4. In the Verification pane, select **Edit Verification Settings** .
5. In the Verification Settings dialog box, provide the desired information, then click **Save**.

Immediately verify newly created image files	(Default: Enabled) Instructs ImageManager to verify each backup image file immediately following its creation.
Periodically re-verify existing image files	(Default: Reverify every seven days) Instructs ImageManager to re-verify backup image files in the managed folder on a regular basis. You can re-verify the backup image files every 1 - 30 days, as specified in the **Days** field.
Override default performance impact for image file verification	(Default: Disabled) Lets you manage how the ImageManager agent uses processing resources during the verification process. More processing resources result in faster verification, but can impact other system operations. When this setting is disabled, the agent uses the throttling setting in Agent Settings to manage I/O usage by ImageManager (see the General 16 tab in

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	Agent Settings).

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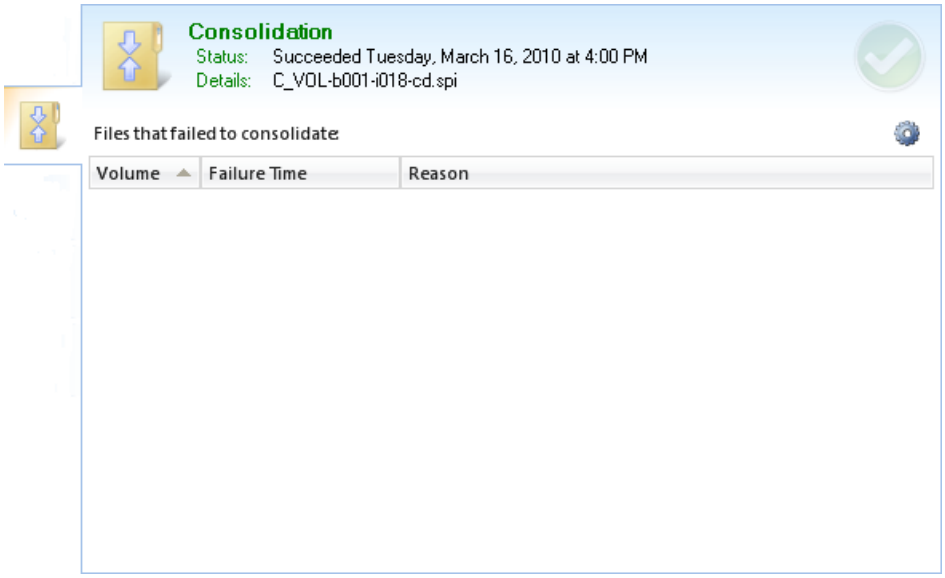
Chapter 6: Consolidating Backup Image Files

The ImageManager consolidation service lets you periodically merge incremental backup image files into consolidated backup image files. Doing this lets you reduce the size of the file chain necessary to restore a system. Fewer files means fewer opportunities for file failure.

You can configure the verification service in the ImageManager Consolidation pane.



The ImageManager Consolidation pane

ImageManager provides the following consolidated file types:

- **Daily Consolidated Files:** At the end of each day, ImageManager can roll-up all Incremental backup image files created during that day into a single point-in-time Incremental image file that contains all updates made to the system that day. Daily consolidated files include a `-cd` in the file name. For example: `D_VOL-b001-i005-cd.spi`.
- **Weekly Consolidated Files:** At the end of each week, ImageManager can roll-up all Daily Consolidated files created during that week into a single point-in-time Incremental image file that contains all updates made to the system that week. Weekly consolidated files include a `-cw` in the file name. For example: `D_VOL-b001-i026-cw.spi`.
- **Monthly Consolidated Files:** At the end of each month, ImageManager can roll-up all Weekly Consolidated files created during that month into a single point-in-time Incremental image file that contains all updates made to the system that month. Monthly consolidated files include a `-cm` in the file name. For example: `D_VOL-b001-i097-cm.spi`.

To configure the consolidation service

1. Launch the ImageManager console.
2. In the Managed Folder pane, select the managed folder you want to work with.
3. In the Services pane, select **Consolidation** .
4. In the Consolidation pane, click **Edit Consolidation Settings** .
5. Select **Enable Image File Consolidation for this Location**.

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This option is selected by default, which enables the ImageManager consolidation service for the currently selected managed folder.

6. In the Consolidation Settings dialog box, select the **Retention** tab, then specify the appropriate settings.

Keep Intra-daily image files	(Default: 30 days) The minimum number of days to keep Incremental backup image files that have been rolled into a daily consolidation.
Keep consolidated daily image files (-cd)	(Default: 90 days) The minimum number of days to keep daily consolidated backup image files that have been rolled into a weekly consolidation.
Keep consolidated weekly image files (-cw)	(Default: 180 days) The minimum number of days to keep weekly consolidated backup image files that have been rolled into a monthly consolidation.
Move consolidated image files to a subdirectory	(Default: Enabled) Following consolidation, ImageManager moves the source backup image files into a subdirectory (`Incrementals`) of the managed folder, rather than deleting the backup image files once consolidated. **Note:** The Incremental files in the `Incrementals` folder are "orphans" since they are no longer stored with their associated Full image. Do not attempt to restore these files from the `Incrementals` folder.

7. In the Consolidation Settings dialog box, select the **Scheduling** tab, then specify the appropriate settings.

Weekly Consolidation	(Default: Saturday) Specifies the effective end of the week for the purpose of creating a Consolidated Weekly backup image file.
Monthly Consolidation	(Default: the 31st day of the month) Specifies the effective end of the month for the purpose of creating a Consolidated Monthly backup image file. You can select a specific date, or a relative day of the week in the month (for example, the last Friday, or the fourth Monday).

8. Click **Save** to save changes to the Consolidation Settings.

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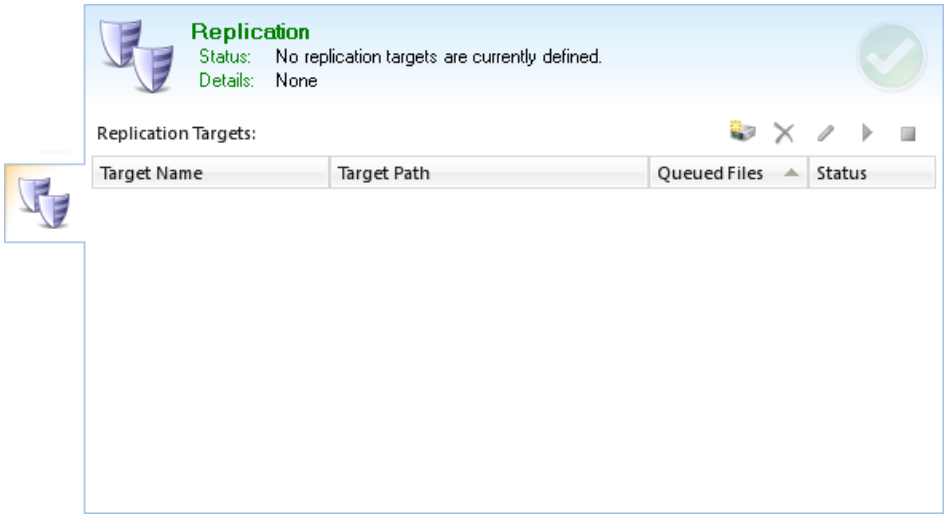
Chapter 7: Replicating Backup Image Files

The ImageManager replication service lets you automatically copy backup image files to a secondary location. You can configure the replication service in the ImageManager Replication pane.



The ImageManager Replication pane

As part of the replication process, ImageManager replication considers your retention policy and other ShadowProtect settings so that it replicates only the backup image files necessary to ensure a full disaster recovery.

The key to using the replication service is to define a replication target. A *replication target* specifies both a destination for the replicated files, and a replication mode that defines how and when ImageManager replicates the files.

To configure the replication target

1. Launch the ImageManager console.
2. In the Services pane, select **Replication** .
3. In the Replication pane, select **Define New Replication Target** .
4. In the Replication Target Settings dialog box, select the **Destination** tab, then specify the appropriate settings.

Type	(Default: Local Drive) Identifies the type of replication target. Supported options include: **Local Drive:** The replication target is attached to the local system (for example, an external hard drive). ImageManager. **Network Drive:** The replication target is accessible via the local network (LAN). **Remote Site:** The replication target is accessible via FTP (File Transfer Protocol). **Note:** Network and Remote replication targets are available only in ImageManager Enterprise, which you can purchase separately.

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Security	(Conditional) Used only when Type = Remote Site. Lets you select the type of secure connection you want to use when connecting to the FTP server. Supported values include: None, SSL, and SSH.
Name	(Optional) A descriptive name for the replication target.
Path	The path to the replication target. The path format varies by type. For example: **Local Drive:** `E:\Replicate` **Network Drive:** `\\serv1\Backup\Replicate` **Remote Site:** `ftp.corp1.com/replicate`
This target requires authentication	When using Network or Remote Site replication targets, provide the authentication credentials necessary to access the network resource or FTP server, respectively.
Don't replicate Base image files	(Default: Disabled for Local or Network replication; Enabled for Remote replication) Instructs ImageManager not to replicate the Base (Full) backup image file as part of the replication process. Due to the size of this file, some organizations might choose to create a secondary copy of this file out-of-band.

5. In the Replication Target dialog box, select the **Replication Mode** tab, then specify the appropriate settings.

   You can distribute the effort of consolidating backup image files by replicating from one managed folder to another managed folder on a different system. By doing this, you can have one system perform daily consolidations while another performs weekly and monthly consolidations. The Replication Mode tab lets you configure your replication service to support your use of the ImageManager consolidation service.

No. Replicate all consolidated files	(Default: Enabled) Select this option when replicating to a folder that is not managed by ImageManager. You can choose the following options when replicating in this way: (Default: Disabled) Also replicate the original Incremental backup image files. (Default: Enabled) When ImageManager deletes a backup image file, it also removes the file from the replication target.
Yes. Replicate only intra-daily or consolidated daily image files	(Default: Disabled) The replication target is also an ImageManager managed folder. You can choose one of the following options when replicating in this way: (Default: Enabled) Replicate the original Incremental backup image files. This means that you plan on performing file consolidation at the replication target, rather than at the source managed folder. (Default: Disabled) Replicate daily collapsed image files. This divides the consolidation effort between the source managed file (daily consolidation) and the replication target (weekly and monthly consolidations).

6. Click **Save** to close the Replication Target Settings dialog box.

Note: For information about the other icons available in the Replication pane, see Section 3.3: Services Pane 12.

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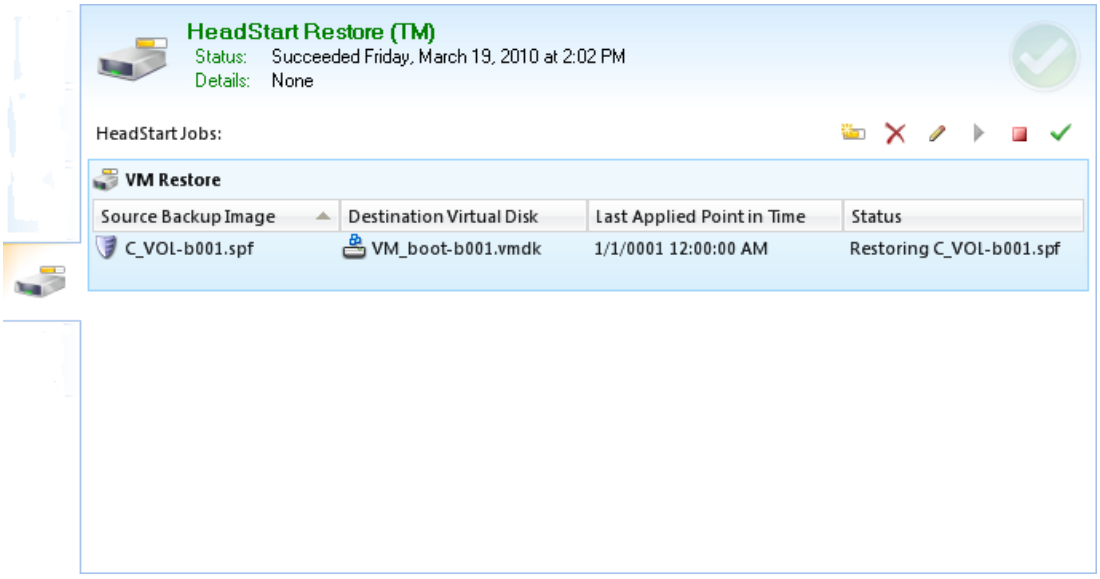
Chapter 8: Using HeadStart Restore

The ImageManager HeadStart Restore (HSR) service lets you start a restore operation while ShadowProtect continues to add Incremental backup image files to the image chain. This provides opportunity to greatly reduce the downtime associated with certain failover operations, particularly for systems that have very large storage systems (multi-Terabyte). For information about HSR use cases, see Section 2.2: Head Start Restore Scenarios 7.

You can access the HeadStart Restore service in the ImageManager HeadStart Restore pane.



The ImageManager HeadStart Restore pane

An HSR operation involves the following tasks:

- Creating a HeadStart Job 29
- Finalizing a HeadStart Job 31

Note: For information about the other icons available in the HeadStart Restore pane, see Section 3.3: Services Pane 12.

8.1 Creating a HeadStart Job

From the HeadStart Restore pane, you can create a HeadStart job that defines a specific restore operation.

To create a HeadStart job

1. Launch the ImageManager console.
2. In the Services pane, select **HeadStart Restore** .
3. In the HeadStart Restore pane, click **Define New HeadStart Job** .
4. In the HeadStart Job Settings dialog box, select the **General** tab, then specify the appropriate settings.

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Type	The type Virtual Machine file that you want HeadStart Restore to create. Supported options include: **VMWare VMDK:** Restore to a Virtual Machine Disk (VMDK) file compatible with VMWare virtual environments. **Microsoft VHD:** Restore to a Virtual Hard Disk (VHD) file compatible with Microsoft and Hyper-V virtual environments.
Name	(Optional) A descriptive name for the HeadStart job.
Folder	The folder where you want to create the virtual disk file.
Authentication	(Default: Disabled) If the specified folder requires authentication to access it, provide the appropriate credentials (Domain/Computer/NAS name, Username, and Password).
HeadStart Volumes	Lists the currently defined HeadStart volumes for this job. A *HeadStart volume* defines both a source backup image and a destination virtual disk file. **To create a HeadStart volume** a. Select **Add HeadStart Volumes** . b. In the Base Backup Images dialog box, select the base backup images to include in the HeadStart job. c. Provide the backup image file password, if necessary. d. Click **OK**. **Note:** Once a HeadStart job saved, HeadStart volumes cannot be modified except to update the password. HeadStart Volumes also provides the following icons for managing the volumes once created: Deletes the selected HeadStart volume. Opens the HeadStart Target dialog box, where you can change the destination file name or password used to open the backup image files.

5. In the HeadStart Job Settings dialog box, select the **Options** tab, then specify the appropriate settings.

Lag Time	The lag time associated with a HeadStart job. You can set the lag time in hours (1 - 23) or days (1 - 30). *Lag time* defines the delay between when ShadowProtect creates a new Incremental backup and HeadStart Restore applies that backup to the HeadStart volume. The lag time protects you by giving you time to identify any problems (system error, corruption, virus, etc.) with the Incremental backup before applying it to the HeadStart volume

6. Click **Save** to close the create the HeadStart job.

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Once created, ImageManager enables the HeadStart job and displays it in the HeadStart Jobs list.

The HeadStart Restore pane also provides the following icons for managing HeadStart Restore jobs:

	Delete the selected HeadStart job.
	Edit the selected HeadStart job.
	Enable the selected HeadStart job.
	Disable (suspend) the selected HeadStart job.
	Finalize a HeadStart job (see Finalizing a HeadStart Job 31).

8.2 Finalizing a HeadStart Job

Once created and enabled, an HSR job begins the process of restoring a volume from its backup image files. However, the restored volume, contained in a virtual disk file, remains unusable until finalized. This prevents users from inadvertently accessing the volume before the restore operation is complete.

To finalize a HeadStart job

1. Launch the ImageManager console.
2. In the Services pane, select **HeadStart Restore** .
3. In the HeadStart Restore pane, click **Finalize Targets in HeadStart Job** .
4. In the Finalize dialog box, provide the required information, then click **Finalize**.

HeadStart Volumes	Select one or more HeadStart volumes to finalize.
Finalize to	For each HeadStart volume that you want to finalize, specify the date and time that you want to finalize it to. Once finalized, the restored volume will exist in the state it was in at the selected date and time. Select **Automatically pick most recent backup image** to finalize the restored volume to the state contained in its most recent Incremental backup.

Once finalized, you must do the following to use the virtual disk file in a virtual machine.

- If the restored volume is bootable, load StorageCraft recovery environment and run Hardware Independent Restore (HIR) to setup the hardware configuration in the virtual disk file to match the settings in the virtual machine. The Recovery Environment displays virtual disk files as available drives that you can work with. For more information about the Recovery Environment and HIR, see the *Recovery Environment User Guide*.
- Add the virtual disk file to a virtual machine. The specifics of this process vary depending on your virtual machine software. Consult your virtual machine documentation for more information.

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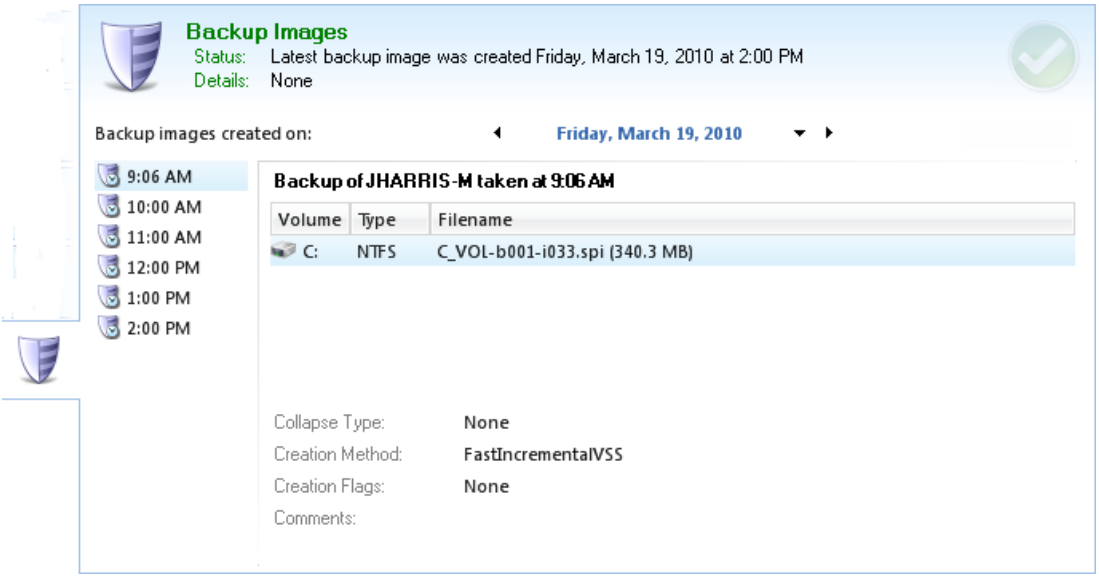
Chapter 9: Browsing Backup Image Files

The ImageManager backup images service lets you view a historical record of your backup image file creation. You can access the backup image service in the ImageManager Backup Images pane.



The ImageManager Backup Images pane

To browse existing backup image files

1. Launch the ImageManager console.
2. In the Services pane, select **Backup Images** .
3. In the Backup Images pane, browse to the desired backup image file.

   You can browse the backup image files available in the selected managed folder by:

   - Use the left-arrow icon ◂ and the right-arrow icon ▸ to browse through dates. By default, the Backup Images pane displays the current date.
   - Use the down-arrow ▾ to open a calendar from which you can select a specific day to view.
   - For each date, ImageManager displays a list of times where backup image files were created in the selected managed folder.
   - Select a time to see a list of backup image files created at that time and date.

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Chapter 10: Product Support

Technical support for StorageCraft products is available beginning with the release of the product and ending six months after the release of the next major version of the product or after StorageCraft discontinues the product line.

Complimentary Technical Support

StorageCraft complimentary technical support consists of self-help support tools that are available at http://forum.storagecraft.com/Community/ (in English only), and an easy-to-use, powerful knowledge base that helps you find answers to the most frequently asked product questions, as well as “how-to” procedures and technical information about all StorageCraft products.

E-Mail Support

Requests for e-mail support in North America are processed 8:00 am to 5:00 pm MST, Monday through Friday. To obtain e-mail technical support for specific technical questions or issues, fill out the form at http://forum.storagecraft.com/Community/. Please provide as much detail as possible to help the technical support engineers understand and diagnose the issue.

In order to ensure efficient service, please provide at a minimum the following information:

- Product name and version number
- Detailed problem description, error code, log file description, etc.
- Hardware and software configuration, operating system version, service pack number, etc.

Telephone Support

StorageCraft support engineers are available Monday through Friday 9:00 A.M. to 5:30 P.M. (MST), except for business holidays. To reach the StorageCraft technical support team, please call: (801) 545-4710. Telephone support is available to all customers with a current maintenance plan or customers who have purchased product maintenance from the StorageCraft Web store. If you are not immediately connected to a support engineer, leave a message and the next available support engineer will return your call.

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Chapter 11: Glossary

Backup: The activity of copying files, volumes, and databases to preserve them in case of equipment failure or other catastrophe. An important part of a disaster recovery strategy, backup is often neglected, particularly for personal computer users.

Backup Image File: Files that contain the contents of a backup activity, Backup Image Files let you restore the contents of a computer system to a specific point-in-time.

Backup Image Set: The Base Image File, plus any Incremental Image Files, that comprise all Backup Image Files for a specific computer system.

Bare Metal Recovery: The complete restoration of computer data after a catastrophic failure, including the operating system, file system, partitions, volumes and data, from a complete backup image.

Base Image File: Backup files that contain a copy of all used sectors on a disk drive. This image file contains all data on the computer, including the operating system, applications, and data.

Basic Disk: A physical disk drive that can be accessed by MS-DOS* and all Windows* operating systems. Basic disks can contain up to four primary partitions, or three primary partitions and an extended partition with multiple logical drives.

Cold Backup: A backup taken from the Recovery Environment, rather than when the computer's operating system is loaded.

Continuous Incrementals: A backup scheduling model for ShadowProtect that lets you create a base backup file, then create additional incremental backup files that include only changes that occurred since the last backup.

Compression: A technology that reduces the size of a file. Compression lets you save time, bandwidth and storage space.

Differential Image File: Backup files containing the hard drive sectors that have changed since the Base Image File was created. Differential image files take about the same time to create as Base Image Files, but they are smaller. When restoring a drive (or files and folders), you must use the Base Image File with the appropriate Differential Image File to restore the computer to a specific point-in-time.

Disaster Recovery: The ability to recover from the complete loss of a computer, whether due to natural disaster or malicious intent. Typical disaster recovery strategies include replication and backup/restore.

Disk Device: A locally accessible disk drive, including locally attached USB or FireWire disk drives, and network drives such as SAN, NAS, iSCSI, SCSI, USB or FireWire.

Driver: A program that interacts with a particular device or software. The driver provides a common interface to the device, or software, that makes it accessible to other computer systems and the user.

Drive Letter: See Mount as Drive Letter.

Dynamic Disk: A physical disk that provides features that basic disks do not (see Basic Disk), such as support for volumes spanning multiple disks. Dynamic disks use a hidden database to track information about dynamic volumes on the disk and other dynamic disks in the computer.

Encryption: A procedure that renders the contents of a file unintelligible to anyone that cannot present the appropriate decryption key.

ExactState™ Imaging: The ability to create a backup image at a point where the computer is in the

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best state for creating a backup (for example, no open files).

Full Image File – See *Base Image File*.

Hard Drive: An electromagnetic storage device, also referred to as a “disk drive,” “hard drive,” or “hard disk drive” that stores and provides access to data on a computer.

Head Start Restore (HSR): The ability to begin the restoration of a large backup image chain while ShadowProtect continues to add Incremental backup image files to the same image chain. This reduces the time necessary to restore a large volume from days or weeks, to minutes or just a few hours.

Hot Backup: A backup image taken when ShadowProtect is loaded on the computer's standard operating system. A hot backup requires the use of a snapshot filter driver (see Snapshot).

Hot Restore: The restoration of a backup image while the computer or server remains up and running. You cannot perform a hot restore of a system volume.

Image or Image File: See *Backup Image File*.

Image Set: The combination of a Full image and all additional Incremental images necessary to restore a computer to a given point-in-time.

Incremental Image File: Backup files containing the sectors that have changed since the last Incremental backup was taken. Incremental Images are fast to create and smaller than either Base Image Files or Differential Image Files. When restoring a drive (or files and folders), you must use the Base Image File and the appropriate Incremental Image Files necessary to restore the computer to a specific point-in-time.

Lock Volume: A software request to gain exclusive access to a particular drive. Locking the volume prevents other software programs from changing the file system or opening files during the process of writing the image file.

Microsoft VolSnap: The proprietary Microsoft snapshot technology.

Microsoft Volume Shadow Copy Service (VSS): The backup infrastructure for Microsoft Windows XP and Microsoft Windows Server 2003 operating systems, as well as a mechanism for creating consistent point-in-time copies of data. The Volume Shadow Copy Service produces consistent snapshots by coordinating with business applications, file-system services, backup applications, fast-recovery solutions, and storage hardware.

Mount as Drive Letter: The process of assigning volumes (active primary partitions and logical partitions) to specific letter designators in the root namespace of a Microsoft operating system. Unlike mount points (see Mount Point), drive letter assignment permits only letters in the namespace, and they solely represent volumes. In other words, it is a process of naming the roots of the "forest" that represents the file-system (with each volume being an independent tree therein).

Mount Point: A directory on a volume that an application can use to "mount" (set up for use) a different volume. Mount points overcome the limitation of drive letters (see Mount as Drive Letter) and allow for more logical organization of files and folders.

Mounted Volume: The ability to see and use a backup image that is physically located somewhere else on the network. When mounted, the backup image appears as a volume and behaves as if it is a part of the local computer system. Mounted volumes are read/write capable so users can update existing image files, scan for viruses or other malware, and repair the image file.

Operating System: Software that, after being loaded into the computer by a boot program, manages all other programs on a computer. Other programs are called *applications* or application programs.

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Partition: The portion of a physical disk that functions as though it were a physically separate disk. Once created, a partition must be formatted and assigned a drive letter before data can be stored on it. On basic disks, partitions can contain basic volumes, which include primary partitions and logical drives. On dynamic disks, partitions are known as dynamic volumes and come in the following types: simple, striped, spanned, mirrored, and RAID–5 (striped with parity) volumes.

Restoring: The activity of retrieving computer data from a previously saved backup image file.

Snapshot: A type of backup that provides a point-in-time view of a volume. When you perform a backup or scheduled backup, ShadowProtect uses either StorageCraft Volume Snapshot Manager (VSM) or Microsoft Volume Shadow Copy Service (VSS) to take a snapshot of the volume. Any changes that occur to the volume after the snapshot is taken are not included in the backup.

.spf: A file extension representing a ShadowProtect full or base image file.

.spi: A file extension representing a ShadowProtect incremental or differential image file.

.sp(number): A file extension representing a ShadowProtect image file that spans multiple files. The number following .sp is the sequence of the file in the spanned image file group.

Point-In-Time Backup: A backup routine that lets you restore a file, folder, or the entire system to a specific point-in-time. Point-in-time backups are often used to roll-back a computer to a point prior to a computer problem.

Protected Volumes: Volumes that users have selected for backup by ShadowProtect.

RAID: Redundant Array of Independent Disks. A collection of disk drives that offers increased performance and fault tolerance. There are a number of different *RAID* levels. The three most commonly used are 0, 1, and 5:

- Level 0: striping without parity (spreading out blocks of each file across multiple disks).
- Level 1: disk mirroring or duplexing.
- Level 5: block-level striping with distributed parity.

Real-Time: A level of computer responsiveness that a user perceives as essentially immediate, or that enables the computer to keep up with some external process such as backing up.

Recovery Environment: See StorageCraft Recovery Environment.

Remote Computer (Node): A computer that is physically located somewhere else on a network but is accessible from a local computer.

Service: A program, routine, or process that performs a specific system function to support other programs, particularly at a low (close to the hardware) level.

Scheduled Job: A job created in the ShadowProtect interface. Scheduled jobs let ShadowProtect backup events to occur automatically.

Spanned Image Set: A Backup Image File that has been divided into multiple smaller files for easier management or storage. This lets you save the Backup Image File to removable media such as a CD or DVD.

StorageCraft Recovery Environment: A secondary boot environment (or operating system) that gives a user the functionality necessary to access and restore Backup Image Files on a network. This environment is typically used when a drive cannot be restored from within Windows or when the computer has suffered a catastrophic failure and the entire hard drive must be restored.

System Downtime: The amount of time a server or PC is offline and inaccessible to users. This is commonly known as having the system out of production.

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System Volume: The volume that stores the boot files necessary to load an operating system. Typically, this is the `C:\` volume.

Tray Icon: A graphical representation of a computer program or application. For example, ShadowProtect uses a tray icon for the user to gain information about the program. Tray icons reside in the system tray.

UNC (Universal Naming Convention): A method used to identify folders, files and programs on a network computer. A UNC path begins with two backslashes \\ followed by the server name, share name, directory and filename. For example, `\\server_name\share_name\backup_name.spi`.

Unprotected Volumes: Volumes not protected by ShadowProtect.

User Interface (UI): The portions of a computer system with which a user interacts (display, keyboard, mouse, etc.) and the portion of a software program that accepts and responds to user interaction.

Virtual Private Network (VPN): A private data network that makes use of the public telecommunication infrastructure. VPNs maintain privacy through the use of tunneling protocols, encryption, and other security procedures.

VirtualBoot: The ability to create a Virtual Machine based on an existing backup image chain. Once started, the VM provides complete access to data, applications, and services provided by the original system, in a state corresponding with the last Incremental image included in the VM.

Virtual Volume: A locally referenced volume that does not physically exist on the system. ShadowProtect uses virtual volumes for the benefit of protecting computer systems.

Volume: An area of storage on a hard disk. A volume is formatted by using a file system, such as file allocation table (FAT) or NTFS, and typically has a drive letter assigned to it. A single hard disk can have multiple volumes, and volumes can also span multiple disks.

VSS Aware: An application designed to work with Microsoft Volume Shadow Copy Services (VSS) framework to ensure consistent data backup.

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Chapter 12: End User License Agreement

END-USER LICENSE AGREEMENT FOR SELECT SHADOWPROTECT TM SOFTWARE PRODUCTS

END-USER LICENSE AGREEMENT FOR SELECT SHADOWPROTECT TM SOFTWARE PRODUCTS

Please carefully read the terms and conditions of this license agreement (the "Agreement"), which applies to use of the following versions of StorageCraft Technology Corporation™ software: ShadowProtect Server 4.0, ShadowProtect Small Business Server 4.0, ShadowProtect Desktop 4.0, ShadowProtect ImageManager™ 4.0, and ShadowProtect ImageManager Enterprise™ 4.0 (collectively the "ShadowProtect Products" and individually a "ShadowProtect Product"). This Agreement specifies the terms and conditions of your use of any of the foregoing ShadowProtect Products. StorageCraft Technology Corporation ("StorageCraft"), is willing to license a ShadowProtect Product to you as the individual, company or legal entity that will be using the ShadowProtect Product ("you" or "Licensee"), but only on the condition that you accept all terms of this Agreement. This Agreement is a legal and enforceable contract between StorageCraft and you. You accept this Agreement and agree to its terms if you open a package containing a ShadowProtect Product, break the seal on a ShadowProtect Product, click the "I Agree" button, or otherwise indicate assent to the terms of this Agreement by using the ShadowProtect Product (e.g., installing, loading, retaining, or copying the Product). If you do not agree to these terms and conditions, do not open the packaging, break the seal, click the "I Agree" button, or otherwise use the ShadowProtect Product. You may contact StorageCraft's customer service department for information on both obtaining a refund of any License Fee you paid and instructions on returning the ShadowProtect Product and Documentation. If you install or otherwise use the ShadowProtect Product under any trial, evaluation, or purchase transaction, your conduct constitutes acceptance of this Agreement and you will be bound by all of its terms and conditions. You and StorageCraft are sometimes collectively referred to in this Agreement as "the Parties" and individually as a "Party." You may access StorageCraft's website at www.storagecraft.com/legal/ to download and print a copy of this Agreement.

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1.13. "Server Operating System" means any broadly released Microsoft operating system intended for server computers including but not limited to: Windows Server 2003 and Windows Server 2008.

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16.7. Compliance. For Software licensed for business or commercial purposes, during the period this Agreement remains in effect, and for three years thereafter, StorageCraft may verify Licensee's compliance with this Agreement on its premises during its normal business hours and in a manner that minimizes disruption to Licensee's business. StorageCraft may use an independent auditor for this purpose with Licensee's prior approval, which Licensee will not unreasonably withhold.

16.8. Headings and Captions. The headings and captions used in this Agreement are for convenience or reference only and shall not modify, expand, limit, or describe the scope or intent of this Agreement or in any other way affect the terms or conditions of this Agreement.

16.9. Force Majeure. No delay, failure or default in performance of any obligation of StorageCraft hereunder shall constitute a breach of the Agreement to the extent caused by a force majeure.

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16.10. Applicable Law. This Agreement shall be governed and construed in accordance with the laws of the State of Utah, U.S. A., without application of any choice-of-law or conflict-of-law principles, rules, or provision that would result in the application of the laws of any jurisdiction other than Utah. Any action for provisional relief concerning this Agreement or the Parties' relationship hereunder, including but not limited to a temporary restraining order, preliminary injunction, attachment in aid of arbitration, or order for any interim or conservatory measure, shall be brought in Salt Lake County, State of Utah, U.S.A. The Parties consent and submit to the exclusive jurisdiction of the state or federal courts in Salt Lake County, State of Utah, U.S.A., for purposes of any action for such provisional remedy or interim or conservatory measure.

16.11. Dispute Resolution. At the election of either Party to this Agreement, any dispute, controversy, or claim arising out of, relating to, or in connection with the following shall be submitted for final resolution by arbitration administered by the American Arbitration Association (the "AAA"): Licensee's purchase or use of the Software; the Software's performance, including without limitation any alleged deficiency or defect; the existence or breach of a contractual, statutory, or common-law warranty; the terms and obligations of this Agreement; the performance, termination, rescission, or alleged breach of this Agreement; and the Agreement's validity or enforceability, including without limitation any claim that all or any part of this Agreement is void, voidable, unconscionable, or unenforceable (collectively, "Arbitratable Dispute"). Notwithstanding the foregoing, any claim for infringement or violation of copyright, trademark, or other intellectual property rights is not an Arbitratable Dispute, but shall be brought before a court of competent jurisdiction in Salt Lake County, State of Utah, U.S.A. In the event of an Arbitratable Dispute the election to arbitrate must be made in writing by a Party on or before the last day to answer and/or respond to a summons and/or complaint brought by the other Party. If Licensee is a U.S. resident or maintains a place of business in the U.S., the arbitration shall be conducted in accordance with the AAA Commercial Arbitration Rules in effect at the time of the arbitration, excepting any rules pertaining to class arbitrations. If Licensee is not a U.S. resident or does not maintain a place of business in the U.S., the arbitration shall be conducted in accordance with the AAA International Arbitration Rules in effect at the time of the arbitration, excepting any rules pertaining to class arbitrations. (The Commercial Arbitration Rules and International Arbitration Rules are collectively referred to as the "Rules".) The Parties intend that any arbitration between them shall involve only the dispute between the Parties and no other, even identical, dispute between a Party and a third party. Class arbitration shall not be permitted.

If the Arbitratable Dispute involves a claim for damages of $20,000 U.S.D. or less, the arbitration shall be conducted by a single arbitrator selected in accordance with the Rules. All other Arbitratable Disputes shall be conducted by three arbitrators selected as follows: Each Party shall select one arbitrator and deliver written notice of such selection to the other Party and to the AAA within twenty (20) calendar days after the deadline for serving a statement of defense. In the event a Party fails to select an arbitrator or deliver notice of such selection to the other Party and to the AAA within such time period, upon request of either Party, such arbitrator shall instead be appointed by the AAA (as provided in the Rules) within fifteen (15) calendar days of receiving such request. The two arbitrators so appointed shall nominate a third arbitrator, notifying the Parties and the AAA of the nomination within fifteen (15) calendar days of their appointment. If the first two appointed arbitrators fail to nominate a third arbitrator within that time period, then, upon request of either Party, the third arbitrator shall be appointed by the AAA (as provided in the Rules). The third arbitrator shall serve as chairman of the arbitral tribunal. In the event that an arbitrator is no longer able or willing to serve as arbitrator, the method of selection used to select such arbitrator shall be used to select the replacement arbitrator. Any arbitrator must be fluent in the English language and a licensed attorney with experience in software licensing transactions. In the event of an arbitration conducted under the International Arbitration Rules, the arbitrator(s) must also have experience in international software licensing transactions.

The place of arbitration shall be Salt Lake County, State of Utah, U.S.A., unless the Parties agree otherwise in writing. The arbitration shall be conducted in the English language. Any award rendered by the arbitrators must be a reasoned award that: fully sets forth findings of fact from the evidence presented; applies the findings of fact to the law of the case; fully sets forth conclusions of law based upon the Parties' respective legal theories; explains which legal theories were followed and why; and, if damages, costs, and/or fees are awarded, specifies the calculations of the types of damages, costs, and/or fees awarded as to each Party. Any award is final and binding on the Parties and may be challenged in a court of competent jurisdiction only upon those grounds allowed under the Utah Uniform Arbitration Act, Utah Code Ann. section 78B-11-101 et seq. In the absence of challenge, judgment on the award may be entered in any court of competent jurisdiction. Without limiting the authority conferred on the arbitral tribunal by this Agreement and the Rules, the tribunal shall have the authority to exercise equitable principles and award equitable remedies. By agreeing to Arbitration, the Parties do not intend to deprive any court of competent jurisdiction in Salt Lake County, State of Utah, U.S.A., of its ability to issue any form of provisional remedy, including but not limited to a temporary restraining order, preliminary injunction, attachment in aid of arbitration, or order for any interim or conservatory measure. A request for such provisional remedy or interim or conservatory measure by a Party to a court shall not be deemed a waiver of an agreement to arbitrate.

16.12. CDDL. The Software's executable, VBoxHDDXSP.dll, includes unmodified files containing VirtualBox Open Source Edition source code, which is licensed under the Common Development and Distribution License Version 1.0 ("CDDL"). StorageCraft made no "modifications" to the CDDL-licensed files and StorageCraft is not a "contributor" as those terms are defined in the CDDL. Irrespective of the CDDL, the Software is licensed and distributed solely in accordance with the terms and conditions of this Agreement and the CDDL gives Licensee no right, title or interest in or to the Software. The CDDL and all referenced CDDL-licensed source code are available at http://download.virtualbox.org/virtualbox/3.1.2/VirtualBox-3.1.2-OSE. tar.bz2; http://download.virtualbox.org/ virtualbox/3.1.8/VirtualBox-3.1.8-OSE.tar.bz2; and http://download.virtualbox.org/ virtualbox/3.2.0_BETA3 /VirtualBox-3.2.0_BETA3-OSE.tar.bz2..

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16.13. Customer Contact. If Licensee has any questions concerning this Agreement, Licensee may contact StorageCraft as follows: website - www.storagecraft.com; telephone – 801-545-4700; fax - 801-545-4705; mail – StorageCraft Technology Corporation, 11850 S. Election Road, Suite 120, Draper, Utah 84020, U.S.A.

Vers. May 18, 2010

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